WHAT IS CLAIMED IS:

1. A method for patterning a substrate comprising:

providing a substrate;

providing a negative image of a pattern in a fixed medium on a mechanically flexible imprint master;

forming a deformable material over a surface of the substrate;

contacting the deformable material with the negative image of the pattern thereby urging the deformable material to deform into the pattern over the surface of the substrate;

removing the imprint master from the substrate; and

transferring the pattern into the substrate.

2. The method as in claim 1, in which the substrate is formed of a mechanically flexible material and the step of removing includes bending the substrate to remove the imprint master from the substrate.

3. The method as in claim 1, wherein the step of providing the negative image of the pattern comprises forming raised portions and base portions within the fixed medium, the base portions corresponding to the pattern.

4. The method as in claim 3, in which the step of providing the negative image of the pattern includes forming the raised portions to have rounded cross-sectional areas.

5. The method as in claim 1, in which the substrate includes a composite structure of a layer of InP formed over a layer of InGaAsP or InGaAs formed, in turn, over a layer of InP, and the step of patterning the substrate includes forming a pattern within the composite structure.

6. The method as in claim 1, further comprising forming a release agent on the negative image of the pattern prior to the step of contacting.

7. The method as in claim 6, wherein forming a release agent on the negative image of the pattern comprises coating the negative image of the pattern with a short chain thiol.

8. The method as in claim 1, wherein the pattern of the deformable material is formed to include relatively thin residual sections of the deformable material and relatively thick sections of the deformable material and further comprising the step of removing the relatively thin residual sections of the deformable material prior to the step of transferring the pattern into the substrate.

9. The method as in claim 1, in which the step of providing the negative image of the pattern includes forming the negative image of the pattern by one of optical or e-beam lithography followed by RIE etching.

10. The method as in claim 1, further comprising the step of heating one of of before and during the step of contacting.

11. The method as in claim 10, wherein the heating comprises heating above a glass transition temperature of the deformable material.

12. The method as in claim 1, wherein the deformable material comprises a liquid.

13. The method as in claim 1, wherein the deformable material comprises one of photoresist and a viscous polymer.

14. The method as in claim 1, in which the pattern includes a grating structure.

15. The method as in claim 1, in which the imprint master includes first physical alignment structures and the substrate includes corresponding second physical alignment structures and wherein the first physical alignment structures are aligned to the corresponding second physical alignment structures prior to the step of contacting, and the first physical alignment structures mate with the corresponding second physical alignment structures during the step of contacting.

16. The method as in claim 15, in which the second physical alignment structures are film segments formed over the substrate and the first physical alignment structures are recessed portions within the imprint master, the film segments being previously formed portions of a semiconductor device formed on the substrate.

17. The method as in claim 15, in which the second physical alignment structures are raised relief features formed on the substrate and the first physical alignment structures are recessed portions which are recessed into the imprint master to an extent greater than the negative image of the pattern formed on the imprint master.

18. The method as in claim 1, wherein the step of transferring the pattern into the substrate comprises etching the substrate using the deformable material as a mask.

19. The method as in claim 1, wherein each of the fixed medium and the imprint master comprises polydimethlysiloxane (PDMS).

20. The method as in claim 1, further comprising the step of curing the pattern of deformable material after the step of contacting, using one of a thermal treatment and UV radiation.

21. The method as in claim 1, further comprising the step of bending the imprint master one of prior to and during the step of contacting.

22. The method as in claim 1, in which the imprint master includes a generally flat original configuration, further comprising the step of bending the imprint master prior to the step of contacting, and in which the step of contacting includes allowing the imprint master to resile to its original flat configuration.

23. The method as in claim 1, in which the step of removing includes bending the imprint master.

24. The method as in claim 1, in which the negative image of the pattern includes at least one lateral dimension being less than 100 nm.

25. A lithographic imprint master formed of a mechanically flexible material and including a pattern formed in a fixed medium thereon, the pattern including device features having dimensions no greater than 100nm.

26. The lithographic imprint master as in claim 25, wherein the lithographic imprint master is formed of a resilient material.

27. The lithographic imprint master as in claim 25, wherein the lithographic imprint master is formed of polydimethylsiloxane (PDMS).

28. The lithographic imprint master as in claim 25, in which the lithographic imprint master is adapted for contacting a deformable material formed on a surface and deforming said deformable material into the pattern.

29. The lithographic imprint master as in claim 28, further comprising raised alignment features formed on the surface and corresponding recessed alignment features formed on the lithographic imprint master.